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(9610)

BL01: The diversity of living organisms Mark Scheme

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Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Question	Marking guidance	Mark	Comments
01.1	**Taxon** **Name** Animalia / Animal(s) Class Order	2 max	All 3 correct = 2 marks 2 correct = 1 mark 0 or 1 correct = 0 marks) Allow 1 mark if class and order in wrong sequence and animal correct
01.2	Mate them; Do not give fertile offspring; OR Sequencing of DNA / genome; Shows differences; OR Immunological testing / react (blood) proteins with antibodies; Shows different patterns / different proteins;	2	Allow reference to DNA hybridisation Gives lower % hybridisation than between members of same species ***or*** *can separate 2 strands at a lower temperature* *Ignore DNA analysis / DNA testing unless results give sufficient clarification*
01.3	6;	1	

Question	Marking guidance	Mark	Comments
02.1	N = Total number of organisms (in the area); n = Number of organisms of each species (in the area);	1	Both required for 1 mark
02.2	Index takes account of the number of each species OR Index gives less emphasis to rare species;	1	

[cont.

Question	Marking guidance	Mark	Comments
02.3	Any **three** suitable examples + explanation for each: eg Deforestation – Loss of habitat / shelter / food source; Overfishing / *hunting* – Disrupts food chains / web **or** description of example – eg loss of food / predator / *risk of extinction*; Monoculture / farming – Reduction in habitat types / only one or a few habitat types / food types; Fertilisers – run-off causes eutrophication / described; Open-cast mining – habitat loss / toxins released; Dumping of waste – habitat loss / toxins released; Sewage outfall – lowers oxygen / eutrophication (/described); Pesticides – can harm harmless species; Burning fossil fuels – releases SOx / NOx / toxins / soot (blocks light) / acid rain; *Building houses / factories – loss of habitat / shelter / food;* *Removal of hedgerows – loss of habitat / shelter / food;* *Selective breeding – reduction of gene pool;*	3 max	*Allow litter* Pesticides = sub-max 1 mark unless qualified Herbicides + Insecticides = sub-max 2 marks + Allow other suitable examples..... Ignore 'pollution' unqualified

Question	Marking guidance	Mark	Comments
03.1	A = Carbohydrate / sugar; B = Phospholipid; C = Protein;	3	Allow glycoprotein *Allow named sugar – eg glucose* Ignore bilayer
03.2	At 37 °C, phospholipid is more fluid / molten; so allows movement of proteins / immunoglobulins;	2	Allow converse in first marking point *Allow reference to molecules have higher kinetic energy at 37^{o}*

Question	Marking guidance	Mark	Comments
04.1	Meiosis;	1	Correct spelling only
04.2	4;	1	
04.3	2^{23};	1	Allow 8 388 608
04.4	A = centromere; B = chromatid; + Diagram showing: At least one chiasma **or** *products from one chiasma in one cell;* End-product showing recombination – ie 4 types of combination of alleles;	4	*Allow gene locus*

Question	Marking guidance	Mark	Comments
05.1	Electron microscope: **Advantage:** Greater resolution / described (re distinguishing close objects); **Disadvantages:** Non-living matter only; Elaborate preparation re fine sectioning / fixing / dehydration / staining with heavy metals; Preparation may distort structure / give artefacts; No colour; *Vacuum required;*	4 max	 Ignore higher magnification Allow specific example – eg structure of membrane / of organelles **or** can see microfilaments / ribosomes Ignore cost *Allow complex staining process*
05.2	A = Chloroplast; Photosynthesis **or** makes glucose / sugar; B = Cell wall; Supports cell / rigidity / *turgor* / prevents bursting; C = Vacuole; Turgor / rigidity / *support* of cell **or** storage of waste / food / pigment / *ions* / *water*;	6	*Functions must match A / B / C* *Reject function matching incorrect name* *Reject 'vacoule' / 'vacole' / 'vacule'* *Storage must be qualified with correct named substance*

Question	Marking guidance	Mark	Comments
06.1	Change of temperature would change rate of reaction; Need to have only one variable / so pH is the only variable;	1 1	
06.2	5.5 (correct answer = 2 marks);;	2	Allow 1 mark for 5.52 *Allow answer in table – Answer on answer line takes precedence if different* *Allow 1 mark for correct working but incorrect answer*
06.3	On graph: Axes: correct orientation + appropriate scales + labelled inc. units; Points plotted correctly = 2 marks (– 1 for each of 2 errors);; Appropriate smooth curve of best fit;	4	 *Scale – at least ½ grid covered* Allow ecf from 06.2 Allow points marks if anomaly at pH7 not plotted
06.4	(From Table 3): high SD / wide range; (From Figure 7): point not on line **or** value lower than for pH8 ;	1 1	*Allow greater variability / ref. 3.6 is anomalous* Allow line changes direction (eg if plotted point-to-point **or** ref. to change in trend
06.5	Correct optimum pH from student's graph $\pm$ 0.1 / eg 6.3 $\pm$ 0.1 ;	1	
06.6	Enzyme denatured / described re shape change;	1	

Question	Marking Guidance	Mark	Comments
07.1	Cut in different planes **or** Squashed out of shape in narrow capillaries;	1	
07.2	6 000;; **or** $\frac{48\,000}{8}$ **or** $\frac{48}{0.008}$ **or** '6' but wrong order of magnitude ;	2 max	Correct answer = 2 marks *If measurement = 48 ± 1mm – allow answer correct for this for 2 marks* = 1 mark *Allow 1 mark for ecf from incorrect measurement*
07.3	Increases concentration gradient or maintains conc. grad. **or** Lowers concentration of (free) oxygen in the blood;	1	
07.4	30;	1	*Allow ± 1*

[cont.

Question	Marking Guidance	Mark	Comments
07.5	13.81 / 13.8;; **or** $\frac{20}{97} \times 30$ **or** 6.19 **or** 20 – 6.19 but no answer / incorrect answer **or** 97 – 30% of 20.619 **or** 67% of 20.619 but no answer / incorrect answer	2 max	Correct answer = 2 marks = 1 mark = 1 mark Allow 97 – 30 = 67 and 67% of 20 = 13.4 for 1 mark **or** 100 – 30 = 70 and 70% of 20 = 14 for 1 mark
07.6	Release more oxygen (to the muscles) **or** release oxygen more easily; For use in respiration/ energy release;	2	*Need 'more' at least once for full marks* Reject energy production Reject anaerobic respiration *Allow less anaerobic respiration / less lactate produced*

Question	Marking Guidance	Mark	Comments
08.1	1. Reducing sugar: heat with Benedict's → orange / red precipitate; then Non-reducing sugar: 2. Boil supernatant in acid; 3. Neutralise and repeat Benedict's test → orange / red precipitate;	3	**or** Weigh precipitate from step 1 Then steps 1, 2 + 3 on 2nd sample of fruit juice → increased mass of precipitate *Allow 1 mark for step 2 + step 3 if no mention of separation of supernatant*
08.2	Step 1 – Ink (pigments) would dissolve in solvent / would be carried up paper by solvent / might mask positions of sugars; Step 2 – Otherwise sugars enter solvent at base of tank / not carried up paper / would be spread (sideways) on paper; Step 3 – To give better separation (in a mixture) / spots would overlap more if larger area */ to prevent contamination of adjacent sugars*; Step 4 – Solvent evaporates so front vanishes – need to measure sugar mobility relative to front / to measure R_f;	4	*Allow to measure how far solvent moved before evaporation*
08.3	R_f = 0.84 to 0.89 (in range) ;; **or** $R_f = \frac{\text{Distance moved by A}}{\text{Distance moved by solvent}}$ but no answer / incorrect answer	2 max	Correct answer = 2 marks = 1 mark

Question	Marking Guidance	Mark	Comments
08.4	A = Fructose B = Glucose C = Sucrose	1	All 3 correct for 1 mark
08.5	1 2 Relative movement of glucose : maltose 1.08 1.64 **or** Relative movement of maltose : glucose 0.92 0.61 **or** Allow differences in R_f expressed as percentages: Difference as % of R_f of glucose: 7.7 39 **or** Difference as % of R_f of maltose: 8.3 64; So greater separation with solvent 2 ***or*** *larger difference in R_f with 2*;	2	*1 2* *Allow subtraction: 0.03 0.07*

Question	Marking Guidance	Mark	Comments
09.1	Correct named components: phosphate + deoxyribose + base; Correct structure: phosphate – deoxyribose – base ;	2	Allow a named base: Adenine / Cytosine / Guanine / Thymine *No mark if 'sugar' / 'ribose' / 'pentose' instead of deoxyribose*
09.2	Hydrogen;	1	
09.3	Any **two** pairs from: **DNA** **mRNA** Deoxyribose Ribose ; Thymine Uracil ; 2 chains 1 chain ; Long chain Short chain ; *Helical* *Non-helical ;*	2 max	
09.4	813;	1	Reject 813.7 / 814 Allow 812 / 811 (re. start / stop signals)
09.5	Non-coding sequences / introns; Are cut out / removed;	2	Allow 1 mark for posttranscriptional modification *Ignore reference to start / stop signals*

[cont.

Question	Marking Guidance	Mark	Comments
09.6	(Most) ribosomes attached to endoplasmic reticulum / *to membranes* in human;	1	
09.7	Only 1 polypeptide chain;	1	*Allow quaternary structure involves interaction with (an)other polypeptide(s)*